AEROSPACE RESEARCH APPLICATIONS CENTER

QUARTERLY REPORT

Period May 1 through July 31, 1967

NASA Contract NSR-15-003-055

Volume I

By

Joseph DiSalvo

Director

August 30, 1967

Aerospace Research Applications Center
Indiana University Foundation
Bloomington, Indiana

TABLE OF CONTENTS

Introduction

For a quick overview of progress to date on each of the fifteen projects, the reader is referred to the diagram below. The X's indicate the phase to which each project had progressed by the end of the quarter.

Project	Percentage of Contract Funds	Development of a Detailed Plan	Final Structuring	Data Gathering or Execution	Evaluation, Analysis and Feed Back	Final Report	Description
1	0.6	x	x	x			Marketing KWIC Index
2	0.6	x	x	x	x	x	SIP's from KWIC
3	1.2	x	x	x			Marketing SIP's
4	0.6	x	x	x	x		Computer SIP
5	5.6	x	x	x	x		Technical SIP's
6	21.0	x	x	x	x		Management Service
7	7.0	x	x	x			University Services
8	7.1	x	x	x	x		SBA Project
9	4.8	x	x	x			Residencies
10	5.5	x	x	x	x		Use Audits
11	8.2	x	x	x	x	x	Research - Cravens
12	8.2	x	x	x	x		Research - Helmkamp
13	8.2	x	x	x			Research - Counts
14	14.0	x	x	x	x		T. U. Institute
15	7.3	x	x	x	x		Urban Project

Project 1 - Marketing KWIC Index:

During the quarter, the computer programming for machine generation of a key word in context (KWIC) Index for all articles in the Marketing Information Service--New Dimensions in Marketing Technology--was finished. The key punching for all titles since November, 1964 was accomplished and the KWIC Index was generated. Appendix A of this report is a copy of the KWIC Index.

An appropriate evaluation sheet for the Index is presently under preparation. During the next quarter, the KWIC Index shall be sent to every mailing point of the ARAC marketing service along with the evaluation form.

Project 2 - SIP's Based On Marketing KWIC Index:

Since completion of the Marketing KWIC Index, the results obtained from a pilot group of evaluators shows conclusively that any further breakdown of the marketing articles, such as into standard interest profiles, would not be useful. The reason is that the KWIC Index itself is as fine a tool as is necessary to gain access to marketing articles of interest to particular individuals. The remainder of any of the $868 level of funding for this project shall be devoted to a more complete evaluation of the KWIC Index itself.

Project 3 - Marketing SIP:

After many reiterations by the ARAC, a standard interest profile of possible interest to persons in the marketing area has been defined. The NASA file alone is insufficient to support a SIP in this area and thus all sources of government reports shall be included. Even under these conditions, it appears likely that the SIP will be issued only once each month, rather than twice a month, so that each issue will contain a reasonable number of abstracts.

The marketing SIP described above shall be evaluated by including it with the monthly mailing of the marketing information service for a three-month period. The first mailing of the marketing SIP will also include a cover letter describing the purpose and objective of the SIP. The last mailing will be sent along with an evaluation form.

Project 4 - Computer Information SIP:

A standard interest profile which identifies reports that should be of interest to computer users has been formulated during the last quarter. This SIP is currently being distributed and evaluated. A description of the SIP along with a recent issue of it is contained in Appendix B.

Project 5 - Development of Technical SIP's:

This project is well under way and into the evaluation period. A total of 46 SIP's have survived the trial period. A major portion of

the effort during the past quarter went into the writing of a manual or guide for using ARAC standard interest profiles. This guide is contained in Appendix C of this report. The guide to the standard interest profiles lists the titles, a brief description of each SIP, and a handy index to the SIP's.

The SIP's are currently under distribution to all other RDC's and to approximately 400 mailing points in ARAC member companies. Evaluation mechanisms are being employed regularly.

The ARAC staff is convinced that this SIP program will play a major role in helping this Center maintain itself on a self-sufficient basis. In order to assist in the marketing of the SIP's, a brief description of the SIP's has been written and is contained in Appendix D of this report.

Review of our hard science profiles indicates that all are doing well enough to be continued with only slight revisions with the exceptions of SIP-23, 42, 43, and 44. No company has shown an interest in SIP-23, PLASMA ENGINEERING, and there is no reason to continue with it. SIP-42, 43 and 44 are our medically oriented profiles and Jane Page proposes to revise them. The descriptions need to be made more attractive. SIP-44, NUCLEAR BIOLOGY, is especially in need of revision. This will be done in August, and we will also add the coverage of the A-80000 series of documents from AEROSPACE MEDICINE AND BIOLOGY for the three medical profiles.

Most of the profiles have crystallized in definition during the first six months of their operation, and for many, the original description of the profile is now considered not to be sufficiently detailed, accurate or attractive to properly represent the reports being cited. Therefore, the revised set of descriptions was prepared. These descriptions are very detailed, and the resulting documentation in itself will be valuable as a mapping of what is attractive to industry from STAR/IAA.

Also, of the hard science SIP's which have been in development, nine are considered to be definitely ready to announce with the revised SIP description list. These are:

SIP-22 VACUUM TECHNOLOGY
SIP-47 PHYSICAL CERAMICS
SIP-49 CONTROL SYSTEMS
SIP-52 SENSORY DEVICES FOR INSTRUMENTATION
SIP-60 SPACE-AGE ENERGY SOURCES
SIP-63 INDUSTRIAL MATHEMATICS
SIP-68 HEAT TRANSFER
SIP-70 HOLOGRAPHY
SIP-71 HUMAN FACTORS ENGINEERING

With these additions we believe that the STAR/IAA literature base has been "well milked" for Standard Interest Profiles. A few future possibilities still remain from dividing or recombining the profiles we

now have, but it has become very difficult to develop additional profiles that will meet standards of quality of reports and consistent quantity of citations. Our number of hard science SIP's now stands at 46, as mentioned above.

Another aspect of the SIP program which has been investigated is the extension of literature base to include USGRDR and NSA. This was evaluated for Issues 6 and 7, 1967. On the basis of our experience, it appears that with the added base, at least six profiles would become too large and therefore require division and redefinition. These are:

SIP-04 PHYSICAL METALLURGY
SIP-26 CRYOGENICS AND SUPERCONDUCTIVITY
SIP-44 NUCLEAR BIOLOGY (with NSA, the citations per issue will explode)
SIP-47 PHYSICAL CERAMICS
SIP-49 CONTROL SYSTEMS
SIP-68 HEAT TRANSFER

More operating time and expense will result from incorporation of the two additional abstracting journals, and this was also evaluated for Issues 6 and 7. Based on this, it seems reasonable to expect one additional half hour per staff engineer per profile per issue. Since the abstracts do not come on cards as does STAR/IAA, additional clerical time will be required to reporduce abstracts from the journals themselves in order to announce them. From observation, it appears that about two minutes per abstract will be required for this work.

Cost calculations per profile per year:

Engineer time:
½ hr./issue x 24 issues/yr. x $3.50/hr. =$42/yr.

Added clerical cost to make abstracts from journals:
10 abstracts/issue x 2 min./abs x 1 hr./60 min.
x $1.75/hr. x 24 issues/yr. =$28/yr.

Added Xerox cost to make abstracts from journals:
10abs/issue x $.04/abs x 24 issues/yr. =$10/yr.

Added cost to reproduce announcements with a higher volume of abstracts:
0.5 x $110.issue x 24 issues/yr. ÷ 41 profiles =$31/yr.

$111/yr.

For Breakeven @ 5 copies of each profile, the price increase would have to be: $22/profile.

A major cost is in preparing the abstracts by the system of copying from the journals. This is the cost we are least confident about, but it is big, and before embarking on the 4 journal program, we should try to devise a system for making these abstracts for less expense.

The expense increase is sufficient to recommend that the inclusion of additional journals be done in conjunction with an announcement of a price increase in SIP profiles, and perhaps simultaneously with a "sales campaign" to promote them to a large market of potential users--beyond our member companies.

If all four journals were used, the most complicated part of editing some of the profiles would be in trying to minimize duplicated announcements. There is no way to completely eliminate this, but only to make editing procedures which will minimize it:

1. Edit STAR and IAA first. Eliminate previously announced duplicates by memory.

2. Edit USGRDR second. "N" documents and "AEC" documents are usually so noted and can be eliminated.

3. Edit NSA. Eliminate "AD", "PB" and "N" numbers. When these appear they are usually noted. The citation "Available from CFSTI" usually denotes duplication with USGRDR.

4. The "Not Available from CFSTI" citations and the documents not available from Documentation, Inc., can be indicated as not available from ARAC without long explanations.

The overlap problem complicates the servicing of document requests. In a recent report Norm Schuld outlined the various options which ARAC could take in providing document back-up for the services. For the SIP's there is an additional problem of specifying documents we can supply from those we can't. The order rules can get very complicated for persons completely unfamiliar with government reports.

Therefore it is suggested that when ARAC extends coverage to USGRDR and NSA, the editing staff members use a mark to distinguish reports available from ARAC from those which aren't. This would be much easier for the customer to understand than a two-page set of directions. As an example of the problem, look at what we now have for Management Science. Our exact policy on this requires first determining the future course of our policy on document orders.

By the time we are ready to announce a 4-journal service on SIP's, it is worth considering the advertising of these to all parties who wish to take one, not just member companies. In this regard our present recommendation is:

1. We hold the price to $100 because this is often the authorization limit of middle management personnel who may be interested.

2. Offer a discount to member companies in return for their completion of questionnaires or provision of feedback in other forms so as to guide the content of the profiles.

3. The above two suggestions subsume that we will strive for higher volume than a breakeven of 5 copies per profile.

Project 6 - Management Science Service:

Definitions

As a result of initial profile evaluation forms received from recipients of the service and discussion within ARAC, each profile definition has been carefully reviewed during this quarter. Each of the definitions was made more explicit in terms of the specific subjects or sub-topics which would be included in the profile. This resulted in better "in-house" understanding as well as a more representative description of the actual material available in the NASA and DOD literature bases.

One of the main reasons for putting this much effort into descriptions is that the terminology differences in "soft science" areas such as "management science" present a real problem. (A typical example is the phrase "Operations Research". Exactly what this connotes and what topics should be included within this profile varies from individual to individual.) As mentioned, ARAC's approach in this area has been to make each profile definition as complete and explicit as possible. Although we have achieved in-house agreement on the definitions, they still must prove themselves in the market. Appendix E lists the revised definitions of the Management Service SIP's. Note that the total number of SIP's has been reduced to eight (initially there were 10). Due to the overlap in profile content and market interest, it was decided that the amount of differentiation between several of the profiles did not warrant separate profiles. Quality Control was combined with Product Assurance and Reliability Design and became Quality Control and Reliability. Production Control and Manufacturing Engineering was combined with Logistics and Distribution Analysis to become Production and Materials Management.

Mailing Point Analysis* (As of 7/27/67)

Name	Member Companies[1]	Universities[2]	Total
Qual. Control (38)	22	4	26
Operations Research (39)	26	8	34
Personnel-Bch. Science (41)	20	6	26
Information Systems (46)	27	6	33
Econ. Plan Analysis (53)	28	5	33
Prod. & Mat'ls. Management (55)	20	5	25
R & E Adm. (56)	26	5	31
Computer Software (72)	22	5	27
			235

*Plus each RDC is receiving a set of 8 profiles

[1]Number of member companies = 32

[2]Number of universities = 6 (Boston Univ., Indiana Univ., Univ. of Tennessee, Case Institute, Univ. of Texas, Stanford)

With the present number of recipients reviewing the Management Science Service, each profile is getting a thorough evaluation. With university participants, the service is also getting exposure outside of the industrial realm. The feedback provided by the academic users, particularly at Indiana University where six faculty members are currently receiving profiles, has been most helpful.

In addition to the total numbers of each profile being sent out, another significant figure is the total number of participants or mailing points receiving these 235 profiles. A total of 74 individuals are now signed up to receive one or more profiles. This large number enables us to discern any trends, patterns, etc. within the various profiles.

Although a June 1, 1967 date had been announced as the cutoff for any future participants, it appears that the time lag between the initial announcement of the service (April 26) and this deadline was insufficient for member companies to review the service and indicate willingness to evaluate the profiles. Therefore we extended this deadline.

Feedback (Forms & Results)

For the first four mailings of the MSS, an evaluation form was included at the back of each profile. A sample of this form is shown in Appendix E. Figures to-date indicate that we are receiving about a 30% return on the forms being sent out.

Several significant conclusions were drawn from analysis of these forms. One was that the users disliked articles strictly of "general interest" with no direct bearing on the topic of Management Science (e.g., "The Impact of Technology on Society"). These are now being excluded from the mailings.

A second conclusion was that abstracts related to a very specific problem or application should be reviewed very carefully prior to including them in the profile. Where there is a low probability of "transferring" the approach, techniques, etc. to other areas, this type of abstract is extremely limited in its value to users of the service (for example, an EDP Manual for Ft. Monmouth).

In addition to these general conclusions which were pertinent to the editing portion of preparing the profiles, there were several comments or suggestions involving specific profiles. A sample comment involving Operations Research was as follows: "The subject becomes so broad that almost any paper on applied math is included." Since we realized the existence of this problem, our efforts were directed toward the establishment of an "Industrial Applied Mathematics" profile where math applications involving scientific and technical areas could be included. Thus the Operations Research profile concentrates specifically on math applications and techniques related to classical OR methods and problem areas involving an economic or managerial point-of-view.

At the conclusion of the 4th MSS mailing, the evaluation form shown in Appendix E was discontinued. It was felt that enough information had been gleaned from the completed forms to-date that there was no longer a need to require it from each mailing. Periodic evaluations will be conducted for the remainder of the experiment.

In the sixth mailing (August 1) we plan to include a more comprehensive questionnaire which will provide each participant the opportunity to give us his specific views on each profile he is receiving. A sample of this questionnaire is shown in Appendix E.

To ascertain the general quality of each of the different sources, an analysis of the following question, sent out with the initial evaluation form was made. "How would you rank the different sources of abstracts (distinguished by the prefix number) according to their relevancy?" A review of the responses indicated that N (STAR) abstracts were ranked number one on 7 of the 8 profiles while AD/PB (USGRDR) was ranked number two on 5 of the 8 profiles. A (IAA) was ranked third on 7 of the 8 profiles.

	N	A	AD/PB
Quality Control	65	68	21
Operations Research	73	33	103
Economic Planning	2	13	22
Research and Engr. Adm.	16	19	31
Prod. and Materials Mgt.	32	11	37
Personnel-Behavioral Sciences	37	4	10
Computer Software	30	20	32
Total	285	186	374

It will now be necessary to study this information for the purpose of documenting specific problem areas as well as providing recommendations in this area.

The editing for the MSS profiles continues to be done on a combined manual-computerized basis. The machine indexing of Management Science abstracts is extremely general, thus making it difficult to retrieve reports in the specific areas represented by the profiles. A project has been started this quarter to study the problem. Approximately 350 management-related reports from STAR and IAA were accumulated. A computer printout was made of the following information:

1. Frequency listing of terms used
2. Frequency listing of categories
3. Linear file of indexed terms for each abstract

From a qualitative standpoint, the information found in STAR has been consistently strong in the areas of Quality Control, Operations Research, Computer Software, and Research and Engineering Administration. USGRDR

has been a primary source in Operations Research, Personnel-Behavioral Science, and Economic Planning and Cost Analysis. Thus it can be seen that no one source has dominated the service. Also in certain profiles such as Production and Material Management, none of the literature sources have been consistent in either quality or quantity. Another problem is consistency between issues. At times an issue may contain 10-12 first rate reports on a particular subject while the next issue may have only one or two abstracts in the area.

Plans for Next Quarter

This section will highlight some of the points already made as well as refer to several new efforts which will be carried out during the next quarter.

The major project will be mailing out, analyzing and following up of the questionnaire referenced in Appendix E. This questionnaire is viewed as the primary effort to determine the usefulness of the service to-date. Each recipient of the service will have had the opportunity to review six issues and should be in a position to provide us with his assessment of the service thus far.

A second but very critical activity will be a study of the possibility of incorporating a select number of open literature journals (e.g., Management Service, Journal of Operations Research, Management Services, Journal of Industrial Engineering, etc.) into those profiles where there is considerable user interest, but where NASA and DOD literature has not been able to support the area. (A good example of this is the area of Management Information Systems.) Work will be continued on both MSS profile additions and revisions. Although the number of profiles has been reduced from 10 to 8, there are several areas which are being considered for separate profiles. These include Applied Industrial Mathematics, Statistics, and a division of the Quality Control area into two profiles. Originally there were two profiles in the Quality Control area and they were later combined into one. However, with the possibility of incorporating the NASA monthly publication entitled "Reliability Abstracts and Technical Review" (RATR) into this profile, there may be a sufficient amount of material and interest to again warrant two profiles--one related to reliability in design and a second one concerned with control of quality after design.

The questionnaire is expected to result in a number of improvements in the service during the next quarter. An example might be a better internal organization of each profile to allow users the opportunity to skip over topics of minimal interest. Also, visits to member companies, following up on questionnaire responses, is being planned by the ARAC staff. This direct contact should help evaluate the MSS and result in pinpointing the utility of NASA literature for the service while determining what open literature sources may be required to supplement it.

Project 7 - University Services:

This project continues to grow as ARAC services gain acceptance with academic scientists. It is unfortunate, but after the tremendous effort which was expended to build up an interest among university people, we now find ourselves in a position where we have to discourage them from using the services because funds for this project will be exhausted on the basis of activity among university people. This will seriously limit the amount of funds available for evaluation of these services which was an important part of the project.

The Center is not adding any new university people for subscription services for the remainder of the contract year. We are also making an effort to hold the amount of retrospective searching to a minimum. The enthusiasm displayed of late by these people leads the Center personnel to believe that academicians would probably be willing to pay for these services. It is hoped that the question will be definitely answered after the employment of an evaluation form to be used during the final quarter. The biggest problem facing ARAC in this matter is that, usually, academic institutions require that budgets be turned in at least one to two years prior to use. Unfortunately, the academic users need the services immediately.

Project 8 - SBA Project:

The experimental service year for this project was completed for six of the seven firms as of July 1, 1967. The remaining company, Prosthetics, Incorporated, will complete a year October 1, 1967. Three of the six firms decided not to continue with ARAC as fee paying customers. A brief situation analysis in each is indicated below. Complete details will be provided in the final report on the project.

Barnes and Reinecke, Inc. The company indicates that the services provided were quite useful as reflected in the following statement:

> "This information resulted in a savings in man-hours and an increase in the quality of our delivered item (a state-of-the-art survey and engineering analysis report). No dollar value can be assigned."

During the year, Barnes and Reinecke underwent significant technical manpower reductions and does not plan to continue ARAC service until such time as the facility again expands to its former size in terms of employees.

Nuclear Measurement Corporation. This company never did utilize ARAC services in any meaningful way. For this reason a seventh firm was added to the group in October, 1967, based on the recommendation of Mr. Melton Yelvington of the SBA. The firm turned out to be a poor choice for participation in the experiment.

Mr. Bradley, president of the firm, stated that the services were useful but that time was not available to take advantage of the information provided. He is the bulk of the technical capabilities of the company.

Regency Electronics. Here is another case of a satisfied company. During the experimental period the firm suffered financial reverses "such that at the end of the year their technical manpower was reduced from eight to two engineers. These two men are evidently spending full time for on-line production support, thus virtually eliminating developmental work. One of the two remaining engineers commented as follows:

> "We know the service and like it. We hope that in time we can subscribe to some part of it as we rebuild and begin new developments."

Texscan Electronics, Inc. has indicated a desire to continue with ARAC as a participating member firm. Pollak and Scan, Inc. has also become an ARAC member company. There is a possibility that Ordnance Engineering Associates, Inc. may also become an ARAC member company as negotiations are still under way with them.

While the experiment is not complete, the following preliminary observations can be made:

1. The services required by these firms border on consulting assistance. The bulk of requests seem to center on immediate problem solving needs.

2. The ARAC services provided to these firms have apparently been useful. However, due to limited technical resources and business ups-and-downs, the benefits received are not sufficient to justify the costs involved.

3. Transfers have definitely taken place. (These will be discussed in the final report.)

Project 9 - Residencies in Technology Transfer:

This program continues to attract persons interested in the transfer programs and dissemination activities of a regional dissemination center. This project represents the closest tie which the Center presently has with State agencies acting under the State Technical Service Act. The majority of residents are, by far, from the various designated State agencies.

A program has been developed whereby participants in the residencies may choose the particular emphasis they desire during the residency. Thus the Center is able to accomodate the spectrum of interests which may be represented, varying from those interested in computer aspects

of information retrieval, all the way through the personal interface employed with the ultimate user. The reader is referred to Appendix E of the previous quarterly report on this contract for a detailed breakdown of the program.

Project 10 - Use Audits:

A structural interview guide developed for the Technology Utilization Audit is shown in Appendix F. The objective of the form is to: (1) Seek the answers to a number of specific questions and (2) provide a basis for more spontaneous responses from those interviewed. The guide was designed to attempt to analyze information transfer not only with respect to ARAC services but also in regard to information resources in general. The analysis is broken down into the following parts:

Information Resources
Use of Information Services
ARAC services
Results
New Technology

Pretesting of the guide will be conducted during early August in an attempt to refine the instrument and to eliminate and/or clarify ambiguous questions. Careful analysis of previous audit efforts, coupled with the need to obtain as broad a base of data as possible, led to a more extensive plan of data collection than indicated in the last quarterly report. A broad exposure is planned.

To perform a completely exhaustive audit of all recipients of ARAC services would, of course, be a very expensive undertaking. Consequently, a set of limiting criteria was required to insure unbiased selection of points to visit. In the light of the constraints the following criteria were established:

1. At least one point in each member company will be visited regardless of activity level.

2. All points receiving Selective Dissemination Service output will be visited.

3. At the points visited, all services being received will be audited.

4. Visits will be organized by geographical area. Duplicate visits to the same point will be avoided unless the professional disciplines involved require it.

Under these criteria, a total of 95 points were identified to be visited. Of these, 32 are in the State of Indiana, and 63 are outside the State. Mailing points in Colorado, California, Texas and other far western states were not included in this plan. Of the 63

out of state points, 11 engineers will visit a total of 43 between August 10, 1967 and September 20, 1967.

Each interviewer will receive detailed instructions concerning data collection via the Information Analysis instrument. Briefings will be held to prepare each individual for trips planned in August and September. A complete list of companies outside the state of Indiana and the ARAC staff and engineers making the visits is also shown in Appendix F.

Plans for the next quarter include the collection of data and analysis. Complete results of the audit program will be included in the final report for the project.

Project 11 - Research:

An Exploratory Study of Individual Information-Processing and Decision Making. This study was completed during the quarter. The complete details of the research will be submitted in a separate paper (dissertation) thus providing an overall final report on the study. The cost data for the project shall also be included. An abstract of the study is given below.

> The unprecedented growth of information in recent years has precipitated extensive research. The bulk of this work has been centered on information systems which have been conceived, developed, and implemented to cope with the problems associated with the information "explosion." This study fits into the broad area of research on information-processing and decision-making.
>
> The individual user of information is a vital element in any information system, formal or informal. The impetus for this study emerged from an apparent neglect, or, at best, superficial understanding of the individual's information-processing behavior in the context of problem solving.
>
> The overall objective of the study is an exploratory investigation of the possible correlates of individual information-processing which takes place in solving technical tasks associated with research and development projects and programs. More specifically, the effort is intended to seek out the apparently important variables relating to information-processing, the individual, and the task within a given environment; link these variables into a conceptual analytical structure; and then investigate the existence of relationships among the variables via a field study.
>
> The research is in four parts. The first concerns the identification and evaluation of applicable research

foundations. The three mainstreams of research drawn from are the decision-making process, individual thinking processes, and information processing.

The second phase involves the development of a conceptual system of variables for use in identifying potential relationships and investigating them empirically. Variables are identified from the domains of the individual, task, and individual/task interaction which appear promising as potential correlates of information-processing. A second set of variables is identified within the information-processing phases of search, evaluation, and integration of information into the decision.

The third phase deals with the specific methodology utilized in the study. The Aerospace Research Applications Center at Indiana University provides a research site which offers the many advantages of a quasi-controlled laboratory experiment and yet seems to overcome many of the limitations inherent in studies utilizing college students.

The final phase concerns the analysis of the empirical data of the study utilizing canonical analysis and a discussion of the results obtained in the study.

The results of the research are quite encouraging. The conceptual system of variables appears to be highly associated, with certain variables playing more important roles in the system than others. In particular, an individual's information-processing efficiency, his image state (state of knowledge) for a particular task, his risk-taking propensity, and the result rating of the task (in terms of meeting specified objectives and constraints) appear to impinge rather significantly upon the set of variables in the information-processing domain. These variables represent the individual, task, and interaction domains. Those from the individual domain seem to be the stronger correlates of information-processing.

Thus, the objectives of the exploratory study were accomplished in that certain apparently important variables relating to information-processing, the individual, and the task (within the given environment) were identified, and the existence of inter-relationships indicated between the independent and dependent variable sets.

The results of the study are not operational in that they can be moved intact to some immediate area of application. Rather, they provide a group of findings that can form a base for further research and development. The current state of knowledge on individual information-processing is limited and, at best, this study provides a modest insight into an extremely complex area. The need for further research is apparent.

Project 12 - Cost System Research:

During the period May 1, 1967 to July 31, 1967, the research phase of the cost system design was completed. A research questionnaire was mailed to all of the NASA Regional Dissemination Centers. With the exception of CAST at Wayne State University, all of the centers responded in some form. These results were tabulated, and the author either visited or telephoned various centers to clarify any questionable results.

Also, during the month of May, the literature review study was completed and the results were incorporated with those of the research questionnaire to establish a conceptual foundation for a feasible cost accounting system for the NASA Regional Dissemination Centers. An organization of the literary work that describes the proposed cost system was devised from this conceptual framework. It includes the following topics and was defended as being appropriate in an oral defense of the project, in May with faculty members of the School of Business at Indiana University:

Chapter One - Introduction
Chapter Two - Literature Review
Chapter Three - General System Concepts
Chapter Four - Costing a Retrospective Search Service
Chapter Five - Costing a Current Awareness Service
Chapter Six - Statistical Cost Control

Chapters One and Two were completed during the months of June and July, respectively, and Chapter Three is currently in process.

Project 13 - Automatic Profile Maintainance:

Thus far in this project, the experimental structure has been established and the sample of profiles to be used has been selected. The computer program to be used has been developed and debugged (Appendix G). It was necessary to examine the previously mentioned experimental structure for inconspicuous flaws. To do this, the profile sample has been run, selectively, using the computer program in Appendix G. The indications are that the algorithms which were selected for the original experimental structure will be useful in obtaining a broad spectrum of experimental data for ultimate analysis.

The only change which was indicated during the selective test operation period was accomplished in the past quarter.

Changes in ARAC technical personnel during the past quarter have indicated another variable that will have to be closely scrutinized during the gathering of data. The effects of changing the ARAC technical men who write the profile will be monitored in the coming quarter.

There exists the possibility that a change in engineer, who is responsible for a given profile, could heavily effect the

validity of the results for that portion of the experiment which the profile in question represents. Every attempt will therefore be made to take the final experimental data over a period of time which will preclude any changes of personnel involved.

Project 14 - T.U. Institute:

The staging of the National Conference on Technology Utilization and Economic Growth was held at the Bloomington Campus of Indiana University on July 31--August 4, 1967 essentially completed the active part of this project. A wide variety of subjects were discussed by the distinguished speakers and participants. Appendix H is a list of participants and a final program for the conference.

The turnout for the conference exceeded expectations with 78 speakers and 89 participants. It appears as though the conference was a resounding success as numerous complimentary letters continue to pour in spontaneously.

With the exception of the final report, this project is completed. The final report shall consist primarily of the proceedings for the conference. There will also be a statement of costs as a supplement to the final report.

Project 15 - Urban Technology Transfer:

Our efforts have been concentrated on contacting people currently engaged in urban planning and urban problems to show them samples of NASA and other government agency literature from our information base and discussing with them what might be its immediate utility. Contacts made so far have been with:

Mr. David Brower, Division of Community Planning, I.U. Foundation
The Division of Planning, Indiana State Department of Commerce
Indiana State Highway Department, Division of Planning
Urban Studies Center, University of Louisville

The samples shown were derived from the USGRDR file of information. No reports were found in the NASA file which had enough obvious relevance to urban problems to even include them in the samples. Relevant material in the USGRDR samples has originated from the federal government agencies most directly concerned with social or urban problems, not NASA or DOD.

The following conclusions have resulted from these discussions:

1. A need certainly exists for information transfer among people now engaged in planning for the city. A diversity

of sources exists for this information. What ARAC provided in the USGRDR samples was the output of federal programs specifically designed for regional or urban problems. Many reports of general interest are written at the local level and are not widely distributed. Of all the reports written, the urban planners estimate that a substantial majority would not be of sufficient quality to be worth dissemination.

To solve the problem of information dissemination among urban planning groups, the most feasible type of organization appears to be a relative of the Educational Research Information Centers (ERIC), where each station in the network is both an input and output point.

2. Who is interested in the information? A potential market exists in the groups formed in each metropolitan area to define and deal with the problems of the area in order to qualify for federal grants. A valuable service would be a clearinghouse of federal programs and how to qualify for them. This type of information is a clear and present need to the urban planner of today.

3. Advanced technological information does not have a current market in urban problem solving. ARAC can provide relevant information to specialists who are trying to define urban problems and develop technology to solve them. The NASA file would be very relevant, for example, to a group trying to develop a closed ecological environment which would encompass an entire city. A few isolated groups and individuals are trying to do this in a preliminary way, but there is no large scale funding of such an effort--consequently no one is carrying ideas to a prototype stage. In order to use the NASA file for applications, someone must be working on real hardware approaches to urban problems. Information on control systems, humans factors engineering, or reliability analysis could be relevant if capable people were engaged in trying to make it relevant.

4. What can be done immediately? Of the items discussed, the most immediately feasible one is the assembling of bibliographies of information which could be used as reference materials for persons in urban planning and research. These bibliographies would barely scratch the surface, but they do represent something ARAC could do in the near future. To make them valuable they would have to be indexed, and the document backup for them would have to be readily available. Some suggested topics are:

   a. General Urban Planning (See Note below)

b. Transportation Planning (See Note below)
c. Forecasting techniques (including technological forecasting)
d. Techniques of Cost/Benefit Analysis
e. Programmed learning

5. What can be done on a more long-term basis by ARAC? Several groups throughout the nation are considering methods by which technological and social research information can be conveniently provided to persons engaged in attacking urban problems. It appears that a reasonable course to pursue is to identify these groups and the clientele they propose to serve, and then determine how ARAC or other RDC's could contribute to this effort. It is evident that the major "market" for technological information is researchers working on urban problems, wherever and whenever these people can be found. Management-type information which we can provide is too sophisticated for any but the more advanced management and systems planners involved in urban planning. Therefore, considering the scope and difficulty of these problems, about all that we can hope to accomplish during the rest of the contract time is to construct an approach to the problem. With the advice of several of the people whom we have contacted already, it is expected that some reasonable plan for approaching technology transfer to urban problems can be developed.

(Note: Samples of the type of material which can be found in USGRDR on these subjects were given to the groups contacted. Interest was expressed in having these made available to planning groups, provided document backup was easily available when wanted.)

APPENDIX A

KWIC Index of ARAC

Marketing Service--New Dimensions

in Marketing Technology

KWIC INDEX OF NEW DIMENSIONS IN MARKETING TECHNOLOGY

VOLUME I - 1967*

PUBLISHED BY

AEROSPACE RESEARCH APPLICATIONS CENTER (ARAC)
INDIANA UNIVERSITY FOUNDATION
INDIANA MEMORIAL UNION BUILDING
BLOOMINGTON, INDIANA

September 1967

*LISTS THE 330 REPORTS ANNOUNCED BY ARAC'S MARKETING INFORMATION SERVICE DURING THE PERIOD NOVEMBER 1964 - JULY 1967.

TABLE OF CONTENTS

INTRODUCTION

Recognizing the potential value of government R & D results to private, market oriented industry, the Aerospace Research Applications Center (ARAC) was established at Indiana University in December 1962, as a cooperative effort between NASA, the University, and industry. The Center's basic objective is to formulate, design, and test information systems for linking industrial firms with the base of knowledge being developed through the programs of NASA and other government agencies. The Center seeks to serve four specific purposes:

1. To aid in the development of new and improved products, processes, and materials for commercial markets.
2. To preclude duplication in industrial research and development programs of work already accomplished in whole or part in government programs.
3. To provide a current awareness concerning emerging technology.
4. To extend the base of knowledge concerning the generation, communication, and application of technology.

One of the Center's information transfer services is the Marketing Information Service. The specific purposes of the Marketing Information Service are:

1. To provide company marketing people with information on the latest methods and techniques for increasing the effectiveness of marketing programs.
2. To provide company marketing people with specific problem-solving information.
3. To aid member companies identify new marketing opportunities.

"New Dimensions in Marketing Technology" is the title of a monthly package of approximately ten abstracts of articles designed to provide

marketing managers with information on new developments in marketing management, marketing research, marketing analysis, etc. The articles abstracted in "New Dimensions" cover a wide spectrum of marketing subjects and are selected to reflect new developments in the field of marketing as well as developments in other areas - Operations Research, Communication, Sociology, etc. - which are making significant contributions to marketing management.

The specific aim of "New Dimensions" is to acquaint subscribers of this service with new techniques and methods in the marketing field. To this end, the ARAC staff peruse approximately 70 journals, books, and proceedings in an effort to pinpoint articles which would be of interest to marketing personnel. The journals searched are from both the marketing and non-marketing disciplines containing the kind of information useful for understanding and meeting the demands of tomorrow's markets.

Typical of the journals which are regularly searched are the JOURNAL OF MARKETING, JOURNAL OF MARKETING RESEARCH, JOURNAL OF ADVERTISING RESEARCH, HARVARD BUSINESS REVIEW, BUSINESS HORIZONS, MANAGEMENT SCIENCE, JOURNAL OF OPERATIONS RESEARCH, AMERICAN JOURNAL OF SOCIOLOGY, INTERNATIONAL SCIENCE AND TECHNOLOGY, and various law journals.

This publication of the MIS KWIC INDEX is designed to acquaint the reader with the kind of articles available through the service and:

1. To indicate coverage of all aspects of marketing as shown by the key word indexing.

2. To indicate the journal coverage of the service in order to bring together as many different views on marketing problems as practical and useful.

3. To indicate the author span - that is authors from all areas are brought into the service; business, education (all institutions), government.

NEW DIMENSIONS IN MARKETING TECHNOLOGY

New Dimensions is highly selective in both journal source, content, and author's relationship to the marketing world and knowledge of the marketer's needs.

Conceptually we see the service as a source of information of concern to the marketing manager in his total environment. Therefore, articles will be drawn from many disciplines and from the entire spectrum of management. Marketing is, of course, our basic interest and the bulk of articles will be drawn from the marketing or marketing-oriented literature. The objective is to provide the manager with a full range of articles in the general area. We are, however, partial to the "new" in marketing. This does not mean that the information will be strictly theoretical in nature. Instead we lean heavily on informative writing which stresses new techniques that are of interest and of value to the practicing manager. Similarly, we bring forth information on new product opportunities, the new markets of the near future. We must stress that the service is not exhaustive, but it is highly selective in its coverage of a broad range of (highly selective) journals.

The selection process is based on a number of standards, not the least of which is its value to the marketer. Every journal cannot be screened for every article, every month; however, the MIS analysts circumvent this problem in a variety of ways. The marketing related journals are divided among the analysts who screen each journal upon publication. This is fairly simple and forms the basis of most articles. However, our function is to provide information; therefore, the analyst will scan reporting services, government publication print-outs, and any

other title-content source available. In this way a broad base of management-techniques articles are made available. Often a specific discipline, say accounting, will have articles within the area that are related to the marketing function and these articles may be of interest to our customers. Other areas of management not directly related to marketing may be of interest to our readers; therefore, emphasis will be given to other specialized publications to develop a broad base for the desired information. An example of this would be the current interest in systems. Certainly there have been a number of excellent articles in the marketing journals on systems; however, the basic systems concept must be understood along with its interrelationship with the total firm before "marketing systems" has any real meaning. With this in mind the service has provided a number of general systems articles, a handbook, some background or historical information, and some highly technical publications.

METHOD OF INDEXING

In order to provide an efficient system for identifying these reports, the KWIC (Keyword-in-context) method of indexing has been utilized. The underlying principle of this type of index is that words instead of concepts can be used for indexing. Keywords - i.e. catchwords or essential words - can be extracted from the title. Thus, the context about a keyword helps to define or explain its use which leads the user to the pertinent report or other types of information he desires.

Information, to be readily available and useful, must be organized in a meaningful manner. One method would be to assign each piece of information

a unique identifying number and arrange the pieces in order by this number - the Author-Source Index. An example follows:

Abstract Number	Author	Source	Source Date
G1030	Laser, William	OR	September 1964

A second method of ordering information is by key work indexing - that is selecting words that characterize the content of the information and arranging these according to some system - usually alphabetic - KWIC Index.

KWIC as applied to the Marketing Information Service utilizes both methods. To facilitate a manual search of the file for a particular subject area or topic of interest, each title is machine-indexed (by the computer) under each significant word of the title. These index words are then sorted and listed alphabetically to produce the listing called the KWIC INDEX showing the keyword followed by the title of the report and its accompanying identification number. An example follows:

Operations

Operations Research in Marketing: Some Critical Comments
08 66 G1030

KWIC INDEX

S %CONTINUATION+

MARKET SEGMENTATION AND THE EFFECTIVENESS OF A BRAND@S PRICE AND DEALING POLICIES 04 66 B3021

SHOULD SALESMEN@S COMPENSATION BE GEARED TO PROFITS 03 66 C2010

RATIONALIZING SALESMAN@S COMPENSATION PLANS 06 66 C2013

TRANSIM-GENERAL PURPOSE TRANSPORTATION SIMULATOR, USER@S MANUAL 06 67 D4001

MANAGEMENT@S @FORGOTTEN@ SALES FORECAST 02 66 E1007

THE PRODUCT@S LIABILITY PROBLEM 09 65 H1004

SALE

SOME PRINCIPLES OF MAS PERSUASION. SELECTED FINDINGS OF RESEARCH ON THE SALE OF U. S. WAR BONDS 05 65 B2006

THE CHANGING ANATOMY OF INDUSTRIAL SALE DISTRIBUTION 05 66 D2008

SALES

STANDARD SALES PRICES AND THEIR VARIANCES 07 65 B1005

HOW TO EVALUATE INDUSTRIAL SALES PROMOTION 08 65 C1008

DETERMINING OPTIMUM ALLOCATION OF SALES EFFORT 01 65 C2000

A STUDY OF SALES OPERATIONS 04 65 C2002

SETTING SALES QUOTAS 10 65 C2007

MARKETING EFFECTIVENESS AND SALES SUPERVISION 08 65 C2006

MISSING INGREDIENT IN SALES TRAINING 04 66 C2011

SALES POWER THROUGH PLANNED CAREERS 05 66 C2012

HOW TO IMPROVE YOUR SALES CORRESPONDENCE 07 66 C2015

SALES. PROFIT-ORIENTED SELLING 08 66 C2016

SALES INCENTIVES. WHY THEY WORK, WHEN THEY DON@T, HOW TO USE THEM 09 66 C2017

TEN BIGGEST MISTAKES FIELD SALES MANAGERS MAKE 05 67 C2019

IMPORTANT PROBLEMS IN SALES FORCASTING 12 65 E1006

SALES FORECASTING BY CORRELATION TECHNIQUES 04 65 E1000

EFFECTIVE SALES FORECASTING 11 65 E1004

MANAGEMENT@S @FORGOTTEN@ SALES FORECAST 02 66 E1007

WANTED. SALES MANAGERS FOR MARKETING RESEARCH 05 65 F1003

CONSUMER CONVENIENCE AND RETAIL AREA STRUCTURE AND METHODS

AUTHOR-SOURCE INDEX

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
A-1000	Lindsay, Franklin A.	BH	Summer 1962
A-1001	Willett, R. P.	JM	January 1963
A-100G	Massy, W. F.	JM	January 1964
A-1002	Forrester, Jay W.	HBR	July-Aug. 1958
A-1003	Verdoorn, P. J.	JM	January 1956
A-1004	Bucklin, Louis P.	CMR	Winter 1962
A-1005	Evans, M. K.	HBR	July-Aug. 1959
A-1006	Payne, Bruce	HBR	March-April 1957
A-1007	Buzzell, Robert D. and Slater, Charles C.	JM	July 1962
A-1008	Blood, W. Joseph	NAA	July 1962
A-1009	Albaum, Gerald	AMJ	March 1964
A-1010	Bush, G. A.	HBR	May-June 1961
A-1011	Winer, Leon	JM	January 1965
A-1013	Brith, Stewart H. and Shapiro, Irwin	HBR	Sept.-Oct. 1962
A-1014	Felton, Arthur P.	HBR	July-Aug. 1959
A-1015	MacMurry, Robert N.	HBR	March-April 1965
A-1016	Drucker, Peter F.	MS	1959
A-1017	Edelman, Franz	HBR	July 1965
A-1018	Gordon, Paul J.	BH	Spring 1961
A-1019	Fegley, Robert L.	PRJ	September 1964
A-1020	Brewer and Rosenweig	CMR	Spring 1961
A-1021	Berg, Thomas L.	HBR	July-Aug. 1962
A-1022	Kuehn, Alfred A. and Weiss, Doyle L.	BS	January 1965

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
A-1023	Daniel, D. Ronald	HBR	Sept.-Oct. 1961
A-1024	Doaley, Arch R.	HBR	March-April 1964
A-1025	Leavitt, Theodore	HBR	July-Aug. 1960
A-1026	Young, Robert B.	HBR	Nov.-Dec. 1961
A-1027	Tilles, Seymour	HBR	July-Aug. 1963
A-1028	Weiner, Jack B.	DRMI	May 1964
A-1029	Drucker, Peter F.	HBR	May-June 1963
A-1030	Wickesberg, A. K. and Cronin, T. C.	HBR	Nov.-Dec. 1962
A-1031	Berg, Thomas L.	AMA	Winter 1961
A-1032	Marquez, V. O.	CM	June 1963
A-1033	Kelley, William T.	JM	October 1965
A-1034	Oxenfeldt, Alfred R.	HBR	March-April 1961
A-1035	Ammer, Dean S.	HBR	Jan.-Feb. 1962
A-1036	Tilles, Seymour	HBR	February 1963
A-1037	Levy, F. K.; Thompson, G. L.; and Wiest, J. D.	HBR	Sept.-Oct. 1963
A-1038	Raia, Anthony P. and Margulies, Newton	BH	Fall 1965
A-1039	Schreier, Fred T.	HBR	Sept.-Oct. 1959
A-1040	Whitcomb, J. S.	BM	June 1964
A-1041	Felton, Arthur P.	HBR	March-April 1956
A-1042	Case, H. M.	HBR	Jan.-Feb. 1966
A-1043	Konvalinka, J. W. and Trentin, H. G.	MSS	Sept.-Oct. 1965
A-1044	Gaber, Norman H. and Reynolds, Dana F., Jr.	BTR	December 1965
A-1045	Odiorne, George S.	SPJ	Sept.-Oct. 1964

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
A-1046	Wakefield, B. R.	HBR	Sept.-Oct. 1965
A-1047	Baur, Paul C., Jr.	NAA	March 1965
A-1048	Winer, Leon	JM	April 1966
A-1049	Tilles, Seymour	HBR	Jan.-Feb. 1966
A-1050	Editors	SM	Sept. 20, 1963
A-1051	Weigand, Robert E.	JM	July 1962
A-1052	Uhl, Kenneth P.	BH	Spring 1966
A-1053	Anthony, Robert N.	MSS	March-April 1964
A-1054	Fair, William R.	MS	June 1966
A-1055	Glenman, T. K., Jr.	N64-28816	1964
A-1056	Harder, Virgil and Lindell, Frank R.	BH	Spring 1966
A-1057	Steiner, George A.	CMR	Summer 1964
A-1058	Gaber, Norman	BTR	April 1965
A-1059	Starr, Martin K.	HBR	Nov-Dec. 1965
A-1060	Smathers, Donald J. and Ruggles, Rudy L., Jr.	HBR	March-April 1966
A-1061	Neuschel, Richard F.	MKQ	Spring 1965
A-1062	Tilson, Seymour	IST	June 1965
A-1063	Eberhard, John P.	IST	September 1966
A-1064	Fisch, Gerald G.	MSS	July-Aug. 1964
A-1065	Drucker, P. F.	JB	April 1958
A-1066	Editors	BM	October 1965
A-1067	Ackoff, Russell L.	MKQ	Summer 1966
A-1068	Hueter, J. M.	JIE	October 1966
A-1069	Isenson, Raymond S.	MS	October 1966

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
A-1070	Schon, Donald A.	IST	November 1966
A-1071	Vroom, Victor H.	BM	Action Idea No. 61
A-1072	Miles, Raymond E. and Vergin, Roger C.	CMR	Spring 1966
A-1073	Drucker, Peter	SM	November 1966
A-1074	Barry, John W.	MSS	Jan.-Feb. 1967
A-1075	Gilman, Glenn	BH	Winter 1966
A-1076	Oxenfeldt, Alfred R.	AMA	1966 Fall Conference
A-1077	Stewart, John M.	MKQ	Winter 1966
A-1078	Charnes, A. and Cooper W.W.	MS	October 1966
A-1079	Adler, Lee	HBR	Nov.-Dec. 1966
A-1080	Fuller, R. Buckminster	SM	
A-1081	Gibson, R. E.	CMR	Fall 1966
A-1082	McCale, John J.	JB	Vol. XXXVIII
A-1083	Copisarow, Alcon C.	MKQ	Winter 1967
A-1084	Amstutz, Arnold E.	AMA	1966
A-1085	Editors	KA	News I, 1966
A-1086	Gilmore, Frank F.	CMR	Winter 1966
A-1087	Kotler, Philip	BH	Fall 1966
A-1088	Boyd, Harper W., Jr. and Levy, Sidney J.	JM	October 1966
A-1089	Cox, Donald F. and Good, Robert E.	HBR	May-June 1967
A-1089 (2 part)	Head, Robert V.	DA	May 1967
A-1090	Editors	SM	January 1, 1967
A-1091	Drucker, Peter F.	MKQ	Spring 1967
A-1092	Bower, Marvin	MKQ	Summer 1966

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
A-1093	Albaum, Gerald	CMR	Summer 1967
A-1094	Mattson, Howard W.	IST	December 1965
B-100G	Oxenfeldt, A. R.	HBR	July-Aug. 1960
B-1000	Dean, J.	HBR	November 1950
B-1001	Morgenroth, William M.	JMR	August 1964
B-1002	Dean, J.	JM	
B-1003	Edward, Ide A.		1957
B-1004	Sampson, Richard T.	HBR	Nov.-Dec. 1964
B-1005	Dittrich, N. E. & Kollaritsch, F. P.	MSS	Sept.-Oct. 1964
B-1006	Green, Paul E.	JM	January 1963
B-1007	Schultz, Robert S.	HBR	July-Aug. 1963
B-1008	Warshaw, Martin R.	JM	July 1962
B-1009	Wenty, Theodore E.	JM	April 1966
B-1010	Jamison, Ward	IM	March 1966
B-1011	Oxenfeldt, Alfred R.	HBR	July-Aug. 1966
B-1012	Corsiglia, Jack	IEEE	June 1965
B-2000	Politz, A.	POQ	Winter 1956-57
B-2001	This number was not used.		
B-2002	This number was not used.		
B-2003	This number was not used.		
B-2004	Shaw, Steven J.	JM	January 1965
B-2005	Bauer, Raymond & Buzzell, Robert D.	HBR	Sept.-Oct. 1964
B-2006	Cartwright, Dorwin	HR	1949
B-2007	Editors	BH	Spec.Issue 1961

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
B-2008	Winick, Charles	JM	July 1961
B-2009	Rogers, E. M. & Beal, G. M.	SF	1960
B-2010	Kotler, Philip	JM	October 1965
B-2011	Dockson, Robert C. Jr.	BT	Winter 1963
B-2012	Coleman, Richard P.	AMA	Winter 1960
B-2013	Boyd, Harper W. Jr. & Levy, S. J.	HBR	Nov.-Dec. 1963
B-2014	Hopkinson, Tom M.	HBR	Sept.-Oct. 1964
B-2015	Reynolds, William H. & Myers, James H.	BT	Spring 1966
B-2016	Morrison, Donald G. & Frank, Ronald E.	JMR JB	November 1966 1962
B-300G	Kotler, Philip	JMR	February 1964
B-3000	Green, Paul E.	BH	Fall 1962
B-3001	Riehman, Barry M.	BH	Summer 1962
B-3002	Scheuble, Philip A. Jr.	HBR	Nov.-Dec. 1964
B-3003	Wong, Yung	JM	October 1964
B-3004	Talley, Walter J.	BH	Spring 1964
B-3005	Jaedicke, Robert K.	PSB	April 1958
B-3006	O'Meara, John T.	HBR	Jan.-Feb. 1961
B-3007	Ansoff, H. Igor	HBR	Sept.-Oct. 1957
B-3008	Borcherdt, G. T.	AMA	1957
B-3009	Ames, B. Charles	HBR	Nov.-Dec. 1963
B-3010	Editors	ID	May 1963
B-3011	Christensen, B. M. & Greene, J. R.	MAC	1963
B-3012	Kotler, Philip	HBR	March-April 1965

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
B-3013	Clifford, Donald K., Jr.	DR	May 1965
B-3014	Luck, David J. & Nowak, Theodore	HBR	May-June 1965
B-3015	Gisser, Philip	IM	May 1965
B-3016	Corey, E. Raymond	BH	Spec.Issue 1961
B-3017	Alexander, R. S.	JM	April 1964
B-3018	Haring, Albert	BH	Spec.Issue 1961
B-3019	Wasson, Chester R.	JM	July 1960
B-3020	Levitt, Theodore	HBR	Nov.-Dec. 1965
B-3021	Frank, Ronald E. & Massy, William F.	JB	April 1965
B-3022	McCarthy, E. J.	JB	April 1959
B-3023	Charnes, A.; Cooper, W. W.; DeVoe, J. K.; and Learner, D. B.	DOD	September 1965
B-3024	Vine, Allym	IST	December 1965
B-3025	Ames, Charles B.	BH	Summer 1966
B-3026	Purcell, W. R. Jr. & Hale, Raymond W.	BTR	April 1966
B-3027	Cooper, Arnold C.	HBR	Sept.-Oct. 1966
B-3028	Charnes, A.; Cooper, W. W.; DeVoe, J. K.; and Learner, D. B.	MS	July 1966
B-3029	Mertes, John E.	NTSU	Fall 1966
B-3030	Clifford, Donald K. Jr.	MKQ	September 1965
B-3031	Kotler, Philip	MS	December 1965
B-3032	Levitt, Theodore	HBR	Sept.-Oct. 1966
B-3033	Editors	CEN	October 1966
B-3034	Karger, D. W. & Murdick, R. G.	CMR	Winter 1966

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
B-3035	Crawford, C. Merle	JMR	May 1966
B-3036	Day, Ralph L.	JMR	November 1965
B-4000	Crowther, John F.	HBR	March-April 1964
C-100G	Grossack, Irvin M. & Kelly, Robert F.	BH	Fall 1963
C-1001	Cox, Donald F.	HBR	Nov.-Dec. 1961
C-1002	Buzzell, Robert D.	JMR	August 1964
C-1003	Magee, John F.	AMA	
C-1004	Dean, Joel	JM	January 1959
C-1005	Freeman, Cyril	HBR	July-Aug. 1962
C-1006	Colley, Russell H.	HBR	Sept.-Oct. 1962
C-1007	Kotler, Philip	JAR	March 1964
C-1008	Editors	IM	
C-1009	Lavidge, R. J. & Steiner, G. A.	JM	October 1961
C-1010	Politz, Alfred	JM	October 1960
C-1011	Brooks, Robert C. Jr.	JM	October 1957
C-1012	Cohen, Stanley I.	MS	October 1966
C-1013	Dean, Joel	JM	October 1966
C-1014	Editors	SM	February 19, 1965
C-1015	Smith, Gail	PI	May 14, 1965
C-1016	Dichter, Ernest	HBR	Nov.-Dec. 1966
C-1017	Hinkle, Charles L.	AMA	Fall 1966
C-2000	Ackoff, Russell L.	AM	1955
C-2001	This number was not used.		
C-2002	Brown, Hulswit, & Ketelle	OR	June 1956
C-2003	Mayer, David & Greenberg, Herbert M.	HBR	July-Aug. 1964

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
C-2004	Kinder, William F.	BH	Spring 1964
C-2005	Webster, Frederick E. Jr.	BH	Spring 1965
C-2006	Caswell, W. Cameron	CMR	Fall 1964
C-2007	Herzog, Donald R.	CMR	Winter 1961
C-2008	Semlow, Walter J.	HBR	May-June 1959
C-2009	Kahn, G. N. & Shuckman, A.	HBR	Jan.-Feb. 1961
C-2010	Day, Ralph L. & Bennett, Peter D.	JM	October 1962
C-2011	Frey, J. M.	HBR	Nov.-Dec. 1955
C-2012	Pearson, Andrall E.	HBR	Jan.-Feb. 1966
C-2013	Webster, Frederick E. Jr.	JM	January 1966
C-2014	Editors	SM	January 6, 1961
C-2015	May, Robert C.	IM	October 1965
C-2016	Editors	BM	January 1965
C-2017	Editors	BM	August 1965
C-2018	Katzenback, Jon R. & Champion, R. R.	BH	Fall 1966
C-2019	Henry, J. Porter Jr.	SM	1963
C-2020	Britt, Dr. Steuart Henderson & Adams, Velma	BM	May 1967
C-2021	Reynolds, William H.	BH	Summer 1966
C-2022	Kahn, George N.	SM	1967
C-2023	Sears, William R.	STB	
C-300G	Sprague, Jeremy D.	JM	January 1964
C-3000	Davison, W. Phillips	POQ	Fall 1959
C-3001	Brown, D. B. & Warshaw, M. R.	JMR	February 1965

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
C-3002	Klapper, Joseph L.	POQ	Winter 1958
C-3003	Laser, William & Bell, William E.	JAR	September 1966
D-2001	Artle, R. & Berglund, S.	MS	July 1959
D-2002	Magee, John	HBR	July-Aug. 1960
D-2003	Duncan, Delbert J.	MCMP	
D-2004	Stewart, Wendell M.	JM	January 1965
D-2005	Smith, Charles W.	JM	January 1953
D-2006	Meal, Harlan C.	TDM	December 1964
D-2007	Weigand, Robert	AR	July 1963
D-2008	Morse, Leon	DR	January 1963
D-2009	Bullen, H. J.	SM	May 1965
D-2010	Editors	DC	1966
D-2011	Herring, Dora	MSS	Sept.-Oct. 1966
D-2012	McDonald, A. L. Jr.	BH	Summer 1964
D-2013	Magee, John F.	HBR	July-Aug. 1960
D-2013 (2 part)	Hill, W. Clayton	IM	February 1963
D-200G	Shycon, Harvey N. & Maffei, R. B.	HBR	Nov.-Dec. 1960
D-3000	Whiteman, Irvin R.	JM	January 1964
D-3001	Jamison, Paul E.	TDM	August 1966
D-4000	Ross, Howard R.	IST	November 1966
D-4001	Editors	DOC	May 1966
E-1000	Ferber, Robert	JM	January 1954
E-1001	Oxenfeldt, Alfred R.	HBR	Jan.-Feb. 1959
E-1002	Turner, Robert C.	BH	Spring 1965

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
E-1003	Paranka, Stephen	JM	July 1960
E-1004	Dockson and Myers	USC	January 1964
E-1005	This number was not used.		
E-1006	Lorie, James H.	JB	July 1957
E-1007	Louth, John D.	DR	October 1965
E-1008	Lewis, John P.	JB	October 1962
E-1009	Cairncross, A. K.	IAJ	December 1964
E-1010	Reynolds, William H.	HBR	Sept.-Oct. 1965
F-100G	Massy, William F. & Webster, F. E. Jr.	JMR	May 1964
F-1000	Banks, Seymour	JM	October 1964
F-1001	This number was not used.		
F-1002	This number was not used.		
F-1003	Doris, Robert H.	JM	January 1965
F-1004	Stern & Heskett	HBR	March-April 1965
F-1005	Boyd, H. W. & Brith, S. H.	JMR	February 1965
F-1006	Roberts, Harry V. & Lorie, James H.	BMR	1951
F-1007	Ketchum, Harry W.	AME	Winter 1958
F-1008	Newman, Joseph W.	HBR	March-April 1962
F-1009	Bass, Frank	JB	January 1963
F-1010	Enright, Ernest J.	HBR	May-June 1966
F-1011	Murray, Thomas J.	DR	January 1965
F-1012	Lepstein, Benjamin	JAR	December 1965
F-1013	Wright, David C.	MR	May 1966
F-1014	Day, Ralph L.	BH	Fall 1966
F-1015	Brandt, Steven C.	JM	October 1966

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
F-1016	Thompson, Donald C.	JMR	May 1966
F-1016 (2 part)	Applebaum, William	JMR	February 1967
G-100G	Weiss, Doyle L.	JM	July 1964
G-1000	Baumol, W. J. & Sevin, C. H.	HBR	1957
G-1001	Simon, Leonard S.	JMR	February 1965
G-1002	Green, Paul	JAR	December 1962
G-1003	Ferrara, William L.	MSS	July-Aug. 1964
G-1004	Green, Paul E.	JMR	May 1964
G-1005	Kline, C. A. & Hesler, H.H.	NACA	August 1952
G-1006	Rapoport, L. A. & Drews, W. P.	HBR	May-June 1962
G-1007	Gargiulo, Granville R.	MSS	May-June 1965
G-1008	Meimasoglou, M. C.	B	November 1964
G-1009	Magee, John F.	HBR	July-Aug. 1964
G-1010	Goldman, Marimont, & Vaccara	SCB	November 1964
G-1011	Kotler, Philip	JM	October 1963
G-1012	Magee, John F.	HBR	Sept.-Oct. 1964
G-1013	Enrick, Norbert L.	MSS	Sept.-Oct. 1964
G-1014	Hertz, David B.	HBR	Jan.-Feb. 1964
G-1015	Editors	BM	January 1965
G-1016	Arnoff and Netzorg	MSS	Jan.-Feb. 1965
G-1017	Kuehn, Alfred A.	AMA	1962
G-1018	Wanty, Jacques	OR	March-June 1960
G-1019	Gibbons, Charles C.	AMJ	January 1964
G-1020	Magee, John F.	AMA	1959

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
G-1021	King, William R.	JMR	August 1965
G-1022	Crissy, W. J. E. & Kaplan, Robert M.	BT	Summer 1963
G-1023	Editors	SM	August 1965
G-1024	Johnson, Robert E.	AMA	Fall 1965
G-1025	Spencer, Milton H.	BT	Winter 1963
G-1026	Ehrenberg, A. S. C.	JMR	November 1965
G-1027	Maffai, R. B.	JB	July 1958
G-1028	Lazer, William	JM	April 1962
G-1029	Massy, William F., Frank & Morriaon	JAR	March 1965
G-1030	Lazer, William	OR	September 1964
G-1031	Kaufman, Felix	HBR	Jan.-Feb. 1966
G-1032	Taylor, Thayer C.	SM	1965
G-1033	Green, P. E.; Halbert, M.H.; & Robinson, P. J.	JMR	February 1966
G-1034	This number was not used.		
G-1035	Robins, William R.	SPJ	Nov.-Dec. 1965
G-1036	Daignault, Phyllis	SM	August 20, 1965
G-1037	Crawford, Merle	BH	Summer 1966
G-9038	Roberts, Harry V.	JB	January 1960
G-1038	Hammond, Robert A.	BH	Spring 1962
G-1039	Golde, Roger A.	HBR	July-Aug. 1966
G-1040	Editors	CEN	January 1967
G-1041	Swanson, Rowena W.	AF	June 1966
G-1042	Mossman, F. H. & Worrell, M. L. Jr.	BT	Autumn 1966
G-1043	Malcolm, D. G.	MS	February 1965
G-1044	Weinberg, Robert S.	MBP	1965
G-1045	Hazelwood, R. Nichols	IST	January 1966

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
G-1044	Weinberg, Robert S.	MBP	1965
G-1045	Hazelwood, R. Nichols	IST	January 1966
G-1046	Thompson, William W. Jr. & McNeal, James U.	JMR	February 1965
G-1047	Freimer, Marshall & Simon, Leonard	MS	February 1967
G-1048	Salz, Frank	CMR	Spring 1967
G-1049	Adler, Lee	HBR	May-June 1967
G-1050	Schaeffer, K. H.; with Fink, John B.; Rappaport, Maurice; Wainstein, Leonard; Erickson, Charles J.	AF	February 1963
H-1000	Michael, Richard	LLR	1962-1963
H-1001	Levy, Jack I.	JB	1954
H-1002	Lynn, Robert A.	JM	January 1965
H-1003	Buggie, Frederick D.	JM	April 1962
H-1004	Hursh, Robert D.	JM	October 1963
H-1005	Darnell, Jerome C.	JMR	August 1965
H-1006	Konopa, Leonard J.	BT	Summer 1964
H-1007	Phillips, Charles E. Jr.	UHBR	Fall 1963
H-1008	Editors	SM	December 17, 1965
H-1009	Knopp, Jacky Jr.	JB	January 1966
I-1000	Kennedy, John	NDU	June 1964
I-1001	Whiting, R. B.	AMA	1959 Proceedings
I-1002	Dean, Chauncey	AMA	1964 Proceedings
I-1003	Katz, Arthur J.	JM	April 1965
I-1004	Bierer, Bion B. Jr.	HBR	Sept.-Oct. 1962
I-1005	Weidenbaum, Murray L.	AMA M	1963

ABSTRACT NUMBER	AUTHOR	SOURCE	DATE
I-1006		DOD	1965
I-1007	Boose, William R.	JM	July 1962
I-1008	Peters, Charles L.	NAA	April 1964
I-1009	Divita, Sal J.	HBR	Sept.-Oct. 1965
J-1000	Taylor, James W.	JM	April 1965
J-1000 (2 part)	Patterson, James M.	BH	Spring 1965
J-1001	Harding, Murray	IM	September 1966
K-1000	Kiernan, Paul H.	ITR	July 1964
K-1001	Robinson, Richard D.	IMR	Fall 1965
K-1002	Haner, F. T.	BH	Fall 1966

SOURCE CODE	SOURCE
AF	Air Force Office of Scientific Research
AMA	American Marketing Association
AMA M	Monograph, American Marketing Association
AME	Advancing Marketing Efficiency
AMJ	Advanced Management Journal
AR	Accounting Review
B	Budgeting
BH	Business Horizons
BM	Business Management
BMR	Basic Methods of Research
BS	Behavorial Science
BT	Business Topics
BTR	Battelle Technical Review
CEN	Chemical and Engineering News
CM	Cost and Management
CMR	California Management Review
DA	Datamation
DC	Department of Commerce
DOC	Government Document
DOD	Department of Defense
DR	Dun's Review
DRMI	Dun's Review and Modern Industry
HBR	Harvard Business Review
HR	Human Relations
IAJ	Institute of Acturaries Journal
ID	Industrial Distribution
IEEE	IEEE Transactions on Engineering Management
IM	Industrial Marketing
IMR	Industrial Management Review
IST	Internal Science and Technology
ITR	International Trade Review
JAR	Journal of Advertising Research
JB	Journal of Business

SOURCE CODE	SOURCE
JIE	Journal of Industrial Engineering
JM	Journal of Marketing
JMR	Journal of Marketing Research
KA	Kaiser Aluminum
LLR	Loyola Law Review
MAC	Marketing and the Computer
MBP	Michigan Business Papers # 40
MCMP	Marketing Channels for Manufactured Prod.
MKQ	The McKinsey Quarterly
MR	Management Review
MS	Management Science
MSS	Management Services
NAA	N. A. A. Bulletin
NACA	NACA Bulletin
NDU	Notre Dame University
NTSU	North Texas State University Business Studies
N	Scientific and Technical Aerospace Abstracts
OR	Journal of Operations Research
PI	Printer's Ink
POQ	Public Opinion Quarterly
PRJ	Public Relations Journal
PSB	Publication of the School of Business University of Minnesota
SCB	Survey of Current Business
SF	Special Forces
SM	Sales Management
SPJ	Systems and Procedures Journal
STB	Stanford Bulletin
TDM	Transportation and Distribution Management
UHBR	University of Houston Business Review
USC	University of Southern California: Report to Management